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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/925,742	Applicant(s) HAMAGUCHI, TAKAYUKI
	Examiner Kevin Siangchin	Art Unit 2623

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-15 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-15 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 10 August 2001 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 2 / Aug. 10, 2001.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

Detailed Action

Specification

Objections: Title of the Invention

1. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

Claims

Objections

2. Claim 10 is objected because of the following informality. On line 12 of Claim 10, the word "point" should be replaced with "points".

Rejections Under U.S.C. § 112(2)

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 8 recites the limitations "*The* three-dimensional data generating apparatus", "the detectors", "the selector", "the first detector", and "the second detector". There is insufficient antecedent basis for these limitations in the claim. Claim 8 will be interpreted, henceforth in this document, as:

> *A* three-dimensional data generating apparatus, comprising: an appointing portion for appointing either one of two detectors, wherein a selector selects either one of a first detector or a second detector based on the appointment by the appointing portion.

Rejections Under 35 U.S.C. § 103(a)

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1-4, 7-8 and 11-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Applicant's admitted prior art discussed in the *Description of the Prior Art* section (pages 1-3) of the Applicant's disclosure (pages 1-3), in view of Suzuki et al. (U.S. Patent 6,064,775). For the sake of brevity, the applicant's admitted prior art will be referred to simply as Prior Art.

7. *The following is in regard to Claim 11.* Prior Art discloses conventional techniques for generating three-dimensional (3D) data. In general these techniques include:

(11.a.) Obtaining as plural image data plural images respectively obtained by photographing an object from different angles (Prior Art, page 1, paragraph [0003], sentence 1).

(11.c′.) Generating three-dimensional data of the object based on corresponding points (Prior Art, page 1, paragraph [0003], sentence 2) obtained by either a gradient method (Prior Art, page 2, paragraph [0005]) *or* a correlation method (Prior Art, page 1, paragraph [0003], sentence 3), the corresponding points being a pair of points indicating an identical part of

the object in the plural images.

Furthermore, the statements in Prior Art paragraphs [0006]-[0007], suggest that the gradient method can allay the deficiencies of the correlation method, and vice versa. While Prior Art sufficiently discusses both the gradient and correlation methods and how each may address the other's deficiencies, Prior Art does not explicitly demonstrate that the two methods be used together, in supplementary fashion – that is, Prior Art does not explicitly demonstrate:

(11.b.) Selecting either one of a gradient method or a correlation method.

(11.c.) Generating three-dimensional data of the object based on corresponding points obtained by the *selected* method, the corresponding points being a pair of points indicating an identical part of the object in the plural images.

8. Suzuki et al. disclose an image processing technique that analyzes features of an input image to determine the class of image it belongs to and, based on this determination, selects among a plurality image processing methods the method best suited for the determined type (e.g. texture "stuff", colored "stuff", etc. – see Suzuki et al. Fig. 8A) of image (Suzuki et al. Abstract, column 1 (lines 15-17) , column 2 (lines 9-11 and 18-32), and column 6 (lines 38-52 and 61-64)). With regard to the current discussion, Suzuki et al. demonstrate the selection of an image processing method (referred to as process operator. – see Suzuki et al. column 1, line 25), among at least two such methods, that is most suited to the detected content and/or properties of an input image. See also Suzuki et al. Figs. 3 and 8A. In particular, note that the properties, upon which the selection is made, include contrast, color variation, and luminance. See Suzuki et al. column 2, lines 41-67.

9. The teachings of Suzuki et al., discussed above, and Prior Art are combinable because they are analogous art. Specifically, both teachings are directed toward the analysis and subsequent processing of images. Therefore, given the above teachings of Suzuki et al. and the

complementary nature of the gradient and correlation methods suggested in Prior Art, it would have been obvious to one of ordinary skill in the art, at the time of the applicant's claimed invention, to use the gradient method for determining point correspondences and the correlation method for determining point correspondences together in a supplementary fashion, such that the gradient method or the correlation method is selected depending on which is most amenable to the detected content and/or properties of the input image. The motivation to do so would have been to exploit the relative advantages of each of the methods. More particularly, a method, constructed in this manner, would advantageously accommodate images of low contrast and luminance (i.e. via the gradient method – Prior Art paragraph [0007], sentence 1) and images of highly variable contrast and color gradations (i.e. via the correlation method – Prior Art paragraph [0006], sentence 1). Combining the two methods, in this manner, and incorporating them into the method of 3D data generation, discussed above, would produce a method that sufficiently conforms to the three-dimensional data generating method put forth in claim 11.

10. *The following is in regard to Claim 12.* As shown above, the teachings of Prior Art and Suzuki et al., when combined in the manner discussed above, yields a method that satisfies the limitations of claim 11. Clearly, for a method, utilizing both the gradient and correlation techniques, to have any utility, it must exploit the relative advantages of its constituent methods in deriving point correspondences. Besides being common sense, the teachings of Suzuki et al. suggest this. Since the advantage of each is based on image properties (i.e. low contrast and luminance for the gradient method and highly variable contrast and color gradations for the correlation method), it would have been obvious to one of ordinary skill in the art, at the time of the applicant's claimed invention, to select either one of the methods based on the plural images. The motivation to do so would have been to exploit the relative advantages of the two

methods. Selecting between the two methods, in this manner, would produce a method that sufficiently conforms to the three-dimensional data generating method put forth in claim 12.

11. *The following is in regard to Claim 13-14.* As shown above, the teachings of Prior Art and Suzuki et al., when combined in the manner discussed above, yields a method that satisfies the limitations of claim 12. Prior Art indicates that the gradient method is more amenable to low contrast, low luminance images (Prior Art paragraph [0007], sentence 1) and that the correlation method is more amenable to images having highly variable contrast and color gradations (i.e. Prior Art paragraph [0006], sentence 1). Given this and the teachings of Suzuki et al., it would have been obvious to one of ordinary skill in the art, at the time of the applicant's claimed invention, to select the gradient based method when the image is of low contrast and low luminance. A method obtained as such would adequately satisfy the limitations of claim 13. The motivation to for selecting the gradient method in this manner would have been to exploit the gradient method's facility to derive point correspondences from images of low contrast, low luminance images. Similarly, it would have been obvious to one of ordinary skill in the art, at the time of the applicant's claimed invention, to alternatively select the correlation based when the image has of highly variable contrast and color gradations[1]. A method obtained as such would adequately satisfy the limitations of claim 14. The motivation for selecting the correlation method in this manner would have been to exploit the correlation method's facility to derive point correspondences from images having highly variable contrast and color gradations.

12. *The following is in regard to Claim 1.* Claim 1 recites substantially the same limitations as claim 11. (This claim merely proposes an apparatus implementing the method of claim

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[1] Note that this condition is mutually exclusive of the former (i.e. the image being of low luminance and contrast).

1). Therefore, with regard to claim 1, remarks analogous to those presented above with regard to claims 11 are applicable.

13. *The following is in regard to Claim 2.* As shown above, the teachings of Prior Art and Suzuki et al. can be combined so as to satisfy the limitations of claim 1. It should be apparent that the following are inherent aspects of such an apparatus:

(2.a.) Image data generators that generates image data by photographing an object (e.g. a camera or cameras).

(2.b.) The obtaining portion obtains the image data each generated by the respective image data generators. The image data must be input into the components of the 3D generating apparatus that process this data. Any interface between the camera and these components can be taken to be such an obtaining portion.

Thus, the teachings of Prior Art and Suzuki et al., when combined in the manner discussed above, inherently address the limitations of claim 2.

14. *The following is in regard to Claim 3.* As shown above, the teachings of Prior Art and Suzuki et al. can be combined so as to satisfy the limitations of claim 1. It should be apparent that the following are inherent aspects of such an apparatus: An input portion for obtaining an image data from outside of the apparatus (e.g. a camera or cameras), wherein the obtaining portion obtains the image data from the input portion (see the discussion above with regard to item (2.b.)). Thus, the teachings of Prior Art and Suzuki et al., when combined in the manner discussed above, inherently address the limitations of claim 3.

15. *The following is in regard to Claim 7.* As shown above, the teachings of Prior Art and Suzuki et al. can be combined so as to satisfy the limitations of claim 1. As discussed in Prior Art (Prior Art paragraph [0005], sentence 2), the gradient method involves luminance gradient

calculation for the imaged object. Therefore, any apparatus having components performing the gradient method necessarily includes a "luminance gradient calculation portion" for calculating a luminance gradient of an object. In addition, as discussed numerous times, the gradient method is particularly effective at detecting corresponding points in images having low luminance (Prior Art paragraph [0007], sentence 1). Taking this into account, it would have been obvious to one of ordinary skill in the art, at the time of the applicant's claimed invention, to construct the aforementioned 3D data generating apparatus so as to select either one of the "first detector" (i.e. the detector implementing gradient method) or the "second detector" (i.e. the detector implementing correlation method) in such a manner that the first detector is selected if the calculated luminance is lower than a predetermined value (i.e. the luminance is determined to be sufficiently low) and the second detector is selected if the calculated luminance gradient is higher than the predetermined value. The motivation for doing so would have been to exploit the gradient method's facility to derive point correspondences from images of low contrast and luminance. An apparatus constructed in this manner would sufficiently conform to that of claim 7.

16. *The following is in regard to Claim 8*[2]*.* Prior Art discloses two techniques for detecting point correspondences across several images for the purposes of 3D data generation. These include the gradient method (Prior Art, page 2, paragraph [0005]) and a correlation method (Prior Art, page 1, paragraph [0003], sentence 3). Furthermore, the statements in Prior Art

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[2] Before preceding note that, according to the language of claim 8 (as it is interpreted in this document), a detector of the set of two detectors is appointed and, based on that appointment, a selection is made in favor of the first or second detector. One can draw the logical conclusion from this language that if the first detector is appointed then first detector is selected by the selector and if the second detector is appointed then second detector is selected by the selector. Taken in this light, it would seem that the appointment of a detector and the selection of a detector are effectively the same operation. This illustrates the redundancy of claim 8's language – e.g. the appointed detector is selected, according to claim 8. This is exacerbated by the fact that *appoint* and *select* are synonymous in the English language.

paragraphs [0006]-[0007], suggest that the gradient method can allay the deficiencies of the correlation method, and vice versa. While Prior Art sufficiently discusses both the gradient and correlation methods and how each may address the other's deficiencies, Prior Art does not explicitly demonstrate that the two methods be used together, in supplementary fashion. Specifically, Prior Art does not expressly show or suggest that an apparatus for generating 3D data should employ two point correspondence detectors, each implementing the gradient method or correlation method. Nor does Prior Art illustrate explicitly that one of these detectors should be appointed and selected, based on that appointment.

17. Suzuki et al., on the hand, disclose an image processing technique that analyzes features of an input image to determine the class (e.g. "textured stuff", etc. – Suzuki et al. Abstract lines 3-8) of image it belongs to and, based on this determination, *appoints* an image processing method best suited for the determined type (e.g. texture "stuff", colored "stuff", etc. – see Suzuki et al. Fig. 8A) of image (Suzuki et al. Abstract, column 1 (lines 15-17) , column 2 (lines 9-11 and 18-32), and column 6 (lines 38-52 and 61-64)). This *appointed* method is *selected* from among a plurality image processing methods. Therefore, with regard to the current discussion, Suzuki et al. demonstrate the *appointment* of an image processing method (referred to as process operator. – see Suzuki et al. column 1, line 25), *selected* among at least two such methods, that is most suited to the detected content and/or properties of an input image. See also Suzuki et al. Figs. 3 and 8A. In particular, note that the properties, upon which the selection is made, include contrast, color variation, and luminance. See Suzuki et al. column 2, lines 41-67.

18. The teachings of Suzuki et al., discussed above, and Prior Art are combinable because they are analogous art. Specifically, both teachings are directed toward the analysis and subsequent processing of images. Therefore, given the above teachings of Suzuki et al. and the

complementary nature of the gradient and correlation methods suggested in Prior Art, it would have been obvious to one of ordinary skill in the art, at the time of the applicant's claimed invention, to use the gradient method for determining point correspondences and the correlation method for determining point correspondences together in a supplementary fashion, such that:

(8.a.) The gradient method (implemented by a "first" point correspondence detector) is *appointed* when detected image properties favor using that method, and the first detector is *selected* from a set of two point correspondences detectors to detect point correspondences.

(8.b.) The correlation method (implemented by a "second" point correspondence detector) is *appointed* when detected image properties favor using that method, and the second detector is *selected* from a set of two point correspondences detectors to detect point correspondences.

The motivation to do so would have been to exploit the relative advantages of each of the methods. More particularly, a method, constructed in this manner, would advantageously accommodate images of low contrast and luminance (i.e. via the gradient method – Prior Art paragraph [0007], sentence 1) and images of highly variable contrast and color gradations (i.e. via the correlation method – Prior Art paragraph [0006], sentence 1). The components that perform *appointment* and the components that perform *selection* can be, respectively, regarded as an "appointment portion" and a "selection portion". Combining the teachings of Prior Art and Suzuki et al., in this manner, would yield an 3D generating apparatus that sufficiently satisfies the limitations set forth in claim 8.

19. *The following is in regard to Claim 4.* As shown above, the teachings of Prior Art and Suzuki et al. can be combined so as to satisfy the limitations of claim 1. Suzuki et al. shows:

(4.a.) Judging the type of an object (i.e. classification of an object – e.g. Suzuki et al. Figs. 19a–22 and column 11, lines 1-4, 33-39, and 48-63).

(4.b.) Selecting either one of the plurality of available methods, based on the type of object. This follows from the discussion above (see above with respect to claim 11) and from Suzuki et al. Figs. 19a–22.

20. Given these teachings, it would have been obvious to one of ordinary skill in the art, at the time of the applicant's claimed invention, to further extend the operation of an apparatus conforming to claim 1 to perform or implement steps (4.a) and (4.b). It should be understood from the previous discussion above, that, within the context of such an apparatus, a selection of the various methods – i.e. the gradient method and the correlation method – corresponds, respectively to a selection of the first detector (implementing the gradient method) second and the detector (implementing the correlation method). As discussed above, the motivation for classifying an object depicted in an image – e.g. according to its luminance, contrast, or color distribution (Suzuki et al. column 2, lines 41-67 and Prior Art Prior Art paragraph [0006], sentence 1 and Prior Art paragraph [0007], sentence 1) – and to select based on that method would have been to exploit the relative strengths of each of the apparatus' constituent methods. Thus, the teachings of Prior Art and Suzuki et al., when combined in the manner discussed above, adequately address the limitations of claim 4.

21. Claims 5-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Prior Art, in view of Suzuki et al., in further view of Krumm (U.S. Patent 6,611,622).

22. *The following is in regard to Claim 5.* As just shown, the teachings of Suzuki et al. and Prior Art, when combined in the manner suggested above, yield an apparatus that satisfies the limitations of claim 4. Neither Suzuki et al. nor Prior Art, however, expressly show or suggest:

(5.a.) The object judging portion judges whether or not the object is a human.

(5.b.) The selector selects either one of the first detector or the second detector in such a manner that the first detector is selected if it is judged that the object is a human and the second detector is selected if it is judged that the object is not a human

Taking into account the discussion above relating to claim 4, or more simply the language of claim 4, it should be clear that the selection in (5.b.) would be based on whether the object is human or not. As will be shown below, the order of the selection according to (5.b.) is suggested in Prior Art. Therefore, essentially the only aspect of (5.a.) and (5.b.) absent from the teachings of Suzuki et al. and Prior Art is the judgment of whether or not the object is a human.

23. Krumm disclose an object recognition process for identifying people (and other predefined objects) in an image of a scene (Krumm column 2, lines 42-61). That is, the object recognition process judges whether (Krumm column 2, lines 42-61) or not (Krumm Fig. 6 step 608) an object is human.

24. The teachings of Krumm are combinable with those of Prior Art and Suzuki et al. because they are analogous art. In particular, the teachings of each is directed toward the analysis and subsequent processing of images. Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the applicant's claimed invention, to extend the operation of the judging portion of the apparatus, obtained by combining Prior Art and Suzuki et al., in order to identify images or regions of images depicting a human(s), according to Krumm's process of object recognition. Furthermore, Prior Art indicates that the correlation method is

unsuitable for deriving point correspondences for images of image regions depicting a human(s) (Prior Art paragraph [0006], sentences 2-3), whereas, the gradient method is more appropriate for such images or image regions (Prior Art [0007], sentence 1). This suggests the desirability of a means to detect humans in an image or image region, when using the gradient and correlation methods in a supplementary manner (e.g. as in claim 4). Therefore, given the teachings of Prior Art, in conjunction with those of Krum, it would have been obvious to one of ordinary skill in the art, at the time of the applicant's claimed invention, to configure the apparatus obtained by combining the teachings of Prior Art and Suzuki et al. so as to implement items (5.a.) and (5.b.) above. An apparatus obtained in this manner would conform sufficiently to claim 5.

25. *The following is in regard to Claim 6.* As shown previously, the teachings of Krumm, Suzuki et al., and Prior Art, when combined in the manner discussed above, yield an apparatus that adequately satisfies the limitations of claim 5. Furthermore, the object recognition process of Krumm involves the detection colors of an object (i.e. by a color histogram – Krumm column 2, lines 42-61 and column 3, lines 51-53) and judges that the object is a human if a predetermined amount of a predetermined color is contained in the object (i.e. if the color histogram of the observed image or image region exhibits a similarly to the predetermined *model histogram* corresponding to a human exceeds a predefined threshold – Krumm column 2, lines 50-61). Thus, the teachings of Prior Art, Suzuki et al., and Krumm, when combined in the manner discussed above, adequately address the limitations of claim 6.

26. Claims 9-10 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Prior Art, in view of Suzuki et al., in further view of Matsugu et al. (U.S. Patent 6,621,921).

27. *The following is in regard to Claim 9.* Heeding the discussion above relating to claim 1 (and claim 11), Prior Art, in conjunction with the teachings of Suzuki et al., clearly teach a 3D data generating apparatus comprising:

(9.a.) An obtaining portion for obtaining plural image data representing images obtained by capturing an object from different viewpoints, the image data each representing respective one of the images (Prior Art, page 1, paragraph [0003], sentence 1).

(9.b.) A first detector for detecting corresponding points of the images by a gradient method (Prior Art, page 2, paragraph [0005]).

(9.c.) A second detector for detecting corresponding points of the images by a correlation method (Prior Art, page 1, paragraph [0003], sentence 3).

(9.f.) A generator for generating a three-dimensional data of the object based on the corresponding points (Prior Art, page 1, paragraph [0003], sentence 2) based on the corresponding points detected by the selected detector.

Note that, essentially, these aspects represent physical manifestations of steps (11.a.) -(11.c.) above. The justification for constructing an apparatus so that the two detectors above operate in a supplementary fashion was presented above, with respect to claims 1 and 11. That discussion will not be repeated here. Prior Art and Suzuki et al., on the other hand, do no expressly show or suggest:

(9.d.) A precision (or accuracy or reliability) operation portion for operating a precision (or accuracy or reliability) of the detection of the corresponding points carried out by the first detector based on the corresponding points and a precision (or accuracy or reliability) of detection of the

corresponding points carried out by the second detector based on the corresponding points.

(9.e.) A decision (or selecting) portion for deciding to use (i.e. selecting) either one of the corresponding points detected by the first detector or the corresponding points detected by the second detector based on the precision obtained by the precision operation portion.

28. Matsugu et al. disclose a method for generating 3D data relating to an object from a plurality of photographs of the object (Matsugu et al. *Description of Preferred Embodiments* paragraph 4). This involves the derivation of point correspondences across the plural images (Matsugu et al. column 7, lines 22-65), analogous to those of Prior Art and of the Applicant's claimed methodology. According to the method of Matsugu et al., a reliability, or precision, is calculated and attributed to each of the corresponding points (Matsugu et al. column 10, lines 4-24).

29. The teachings of Matsugu et al. are combinable with those of Prior Art and Suzuki et al. because they are analogous art. In particular, the teachings of Matsugu et al. are directed toward the processing of digital images and, moreover, toward the generation of 3D data obtained from multiple digital images. Therefore, given the teachings of Matsugu et al., it would have been obvious to one of ordinary skill in the art, at the time of the applicant's claimed invention, to attribute a measure of reliability for each of the derived point correspondences (i.e. those obtained by the gradient method, or the corresponding detector, and those obtained by the correlation method, or the corresponding detector). Clearly, the motivation to do so would have been to evaluate the accuracy of each of the methods or detectors used to derived point correspondences. Furthermore, taking into consideration the general teachings of Suzuki et al. – that is, that a method should be selected, over a collection of available methods, if it is best

suited to the observed properties of an input image – it would have been obvious to one of ordinary skill in the art, at the time of the applicant's claimed invention, to configure the apparatus so as to select the point correspondences derived according to the gradient method (i.e. those of the first detector) if their associated reliability measure or precision is greater than the reliability measure or precision associated with point correspondences of the correlation method (i.e. those of the second detector), and vice versa[3]. The motivation for providing such a selection would have been to ensure that the point correspondences used in the 3D data generation are the most accurate that can be derived according to the available stereo correspondence methods. An apparatus configured in this manner would adequately satisfy the limitations of claim 9.

30. *The following is in regard to Claim 10.* As shown above, the teachings of Prior Art and Suzuki et al. can be combined so as to satisfy the limitations of claim 9. According to Prior Art (Prior Art paragraph [0003], sentence 1), a 3D generating apparatus, such as that of claim 9, typically involve "generating three-dimensional data from plural two-dimensional image data ... of an object captured by, for example, using a plurality of cameras" (i.e. a first, second, third, etc. camera, or "image data generator"). Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the applicant's claimed invention, to use a first, second, third, etc. image data generators. It is well-known that methods that attempt to solve the stereo correspondence problem benefit, in terms of accuracy, from multiple views of the scene or object. It is also known that deriving stereo correspondences involves determining points in each of the multiple viewpoints (i.e. the images generated by the multiple image data generators) that correspond to a given point, say a "reference point", in a given viewpoint (e.g. the image data generated by the first image data generator). Finally, as stated in Matsugu et al.

[3] In other words, it would have been obvious to select the point correspondences that are most reliable.

(Matsugu et al. column 10, lines 8-9), "corresponding points are extracted on the basis of a correlation value between the left and right image blocks, the correlation value between the blocks may be used as the reliability". This correlation either includes or can itself be considered a comparison of one corresponding point with the other. Therefore, an apparatus obtained by combining the teachings of Prior Art, Suzuki et al. and Matsugu et al., in the manner discussed above, adequately satisfies the limitations of claim 10.

31. *The following is in regard to Claim 15.* As shown above, the teachings of Prior Art and Suzuki et al., when combined in the manner discussed above, yields a method that satisfies the limitations of claim 11. It would be unequivocally clear to one of ordinary skill in the art that, given two methods for deriving point correspondences (e.g. the gradient method and correlation method), the method that should be selected, among the two, should be that which yields the most accurate or reliable result. This is further supported by the teachings of Suzuki et al., wherein a method is selected, among a multitude of available methods, depending on its amenability to properties detected in the input image. Despite this, neither Prior Art nor Suzuki et al. expressly show or suggest selecting either of the methods based on a comparison of the reliabilities of the corresponding points derived according to gradient method and those derived according to the correlation method.

32. Matsugu et al. disclose a method for generating 3D data relating to an object from a plurality of photographs of the object (Matsugu et al. *Description of Preferred Embodiments* paragraph 4). This involves the derivation of point correspondences across the plural images (Matsugu et al. column 7, lines 22-65), analogous to those of Prior Art and of the Applicant's claimed methodology. According to the method of Matsugu et al., a reliability, or precision, is

calculated and attributed to each of the corresponding points (Matsugu et al. column 10, lines 4-24).

33. Following the previous discussions relating to claims 9-10, the teachings of Matsugu et al., Suzuki et al., and Prior Art are combinable. Also following a similar line of reasoning as presented above, given the reliability or precision that Matsugu et al. ascribe to each of the point correspondences, it would have been obvious to one of ordinary skill in the art, at the time of the applicant's claimed invention, to select the method that yields point correspondences with the greatest reliability or precision. The motivation for selecting between the gradient and correlation methods in this way would have been to ensure that the point correspondences used in the subsequent generation of 3D data is the most accurate. A method obtained in this manner would satisfy the limitations of claim 15.

Citation of Relevant Prior Art

34. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

The following references disclose systems and/or methods that combine gradient-based and correlative methods for finding point correspondences between a sequence of images. Generally, these references use the correspondences to derive 3D models or other 3D data. The gradient method of [1]-[2] involves the disparity gradient which closely resembles, at least in purpose, the gradient method of the Applicant's disclosure.

[1] *U.S. Patent 6,606,406.* Zhang et al. Publication Date: August 2003

[2] *Computing Differential Properties of 3-D Shapes from Stereoscopic Images without 3-D Models.* INRIA Technical Report, July 1994, Devernay and Faugeras.

[3] *U.S. Patent 6,434265.* Xiong et al. Publication Date: August 2002.

[4] *U.S. Patent 6,215,899.* Morimura et al. Publication Date: April 2001.

[5] *U.S. Patent 6,580,810.* Yang et al. Publication Date: June 2003.

The following references teach the designation of reliability, precision, or error to point correspondences. [6] uses the error (indicative of reliability) to select the best correspondences among a set of correspondences derived according to different methods. [8] calculates a distance metric between corresponding points to determine their reliability.

[6] *U.S. Patent 6,580,821.* Roy. Publication Date: Jun 2003.

[7] *U.S. Patent 6,519,358.* Yokoyama et al. Publication Date: February 2003.

[8] *U.S. Patent 6,1816815.* Muragame. Publication Date: January 2001.

These references generally show the selection of a method, algorithm or process among several available methods, algorithms, or processes, according to an analysis of input image data.

[9] *U.S. Patent 6,674,902.* Kondo et al. Publication Date: January 2004.

[10] *U.S. Patent 6,389,169.* Stark et al. Publication Date: May 2002.

[11] *U.S. Patent 6,269,182.* Ishii et al. Publication Date: July 2001

[12] *U.S. Patent 6,608,927.* Ohta et al. Publication Date: August 2003.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin Siangchin whose telephone number is (703)305-7569. The examiner can normally be reached on 9:00am - 5:30pm, Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on (703)308-6604. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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